



UNIVERSITI PUTRA MALAYSIA

**FOREST COMPOSITION, STRUCTURE AND WILDLIFE
ABUNDANCE IN MIXED-DIPTEROCARP FOREST OF
SUNGAI LALANG FOREST RESERVE, SELANGOR**

BOYD SUN FATT

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**MASTER OF SCIENCE
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By

BOYD SUN FATT

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,
in Fulfilment of The Requirement for the
Degree of Master Science**

October 2003

To both my lovely mum *Beatrice* and three sisters *Doris, Doreen & Donna*

Wonderful and THE MOTIVATOR *Mr. Oswald Supi*

My precious and lovely wife *Shirley Bakansing*

Not to forget

My late father, *Sun Fatt Angih*. The greatest man ever lives in my entire life.

Thank you

Intensification Research on Priority Areas
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In fulfilment of the requirement for the degree of Master of Science

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Chairman : Mohamed Zakaria Hussin, Ph.D.

Faculty : Forestry

Tropical rain forest is among the richest ecosystem in the world in terms of flora and fauna diversity. The forest, however, is depleting caused by the encroachment of the forested area such as forest logging. Peninsular Malaysia is practising selective management system (SMS) as one of the sustainable forest management (SFM) in timber harvesting. Such activity would change the forest composition and structure which might also influence to the habitat of plant and animal species.

A study was conducted in three different compartments namely Compartment 18 (five-year old logged forest), Compartment 33 (ten-year old logged forest) and Compartment 24 (VJR) at Sungai Lalang Forest Reserve mainly to compare the forest composition and structure. A total of three 1-ha plots were made at each compartment and covering three different forest habitats of valley-bottom, mid-slope and ridge-top. All trees $\geq 5\text{cm}$ dbh at the three different compartments were tagged and identified up to species level. Tree parameters (tree dbh, tree height and crown width) were also recorded within the study plots for comparison purposes. However, the selected wildlife's composition (primates, pheasants, small mammals and

understorey birds) was taken from the previous study as a secondary data. The data's was then compared as descriptive whether the changing of the forest composition and structure influence the presence of wildlife within each compartments.

The results showed that dipterocarp trees were distributed mainly at Virgin Jungle Reserve than in the logged forest. In contrast, the non-dipterocarp trees were mainly distributed in logged forest compared to Virgin Jungle Reserve. The tree species was richest in Compartment 24 (VJR) which represented 342 species belong to 54 families and 163 genera, compared to Compartment 33 (46 families, 124 genera and 234 species) and Compartment 18 (45 families, 100 genera and 189 species). The number of tree species was also lower in logged forest than in Virgin Jungle Reserve. The Dipterocarpaceae and Euphorbiaceae were found predominantly among the three different forest types, as well as at all different forest habitats. It showed that these families were still abundant even though the forest was disturbed. The species diversity among three different compartments showed that Compartment 24 (VJR) gave the highest Shannon's index value with $H'=5.15$ ($H_{\max}=5.85$), compared to Compartment 33 ($H'=4.85$; $H_{\max}=5.45$) and Compartment 18 ($H'=4.46$; $H_{\max}=5.24$). By comparing among different forest habitats at different compartments showed that the species diversity was highest in valley-bottom and concentrated at Compartment 24 (VJR), followed by Compartment 33 and Compartment 18. The species evenness among three different compartments, however, was high in Compartment 33 with $E_1=0.89$, followed closely by Compartment 24 (VJR) ($E_1=0.88$) and lowest in Compartment 18 ($E_1=0.85$). In addition, the species evenness was distributed indiscriminately among the three different forest habitats at three different compartments. The Sorensen's Index of Similarity showed that the species

abundance between Compartment 33 and Compartment 18 was almost similar. Whereas, the species abundance in Compartment 24 (VJR) was less similar compared with both logged forests. The availability and diversity of the primary forest trees as food sources for wildlife were also decreased from primary to logged forest. The presence of secondary trees such as *Macaranga* spp. and *Mallotus* spp., however, was highest in Compartment 18 and lowest in Compartment 24 (VJR).

There was a significantly different in the forest structure among the compartments where Compartment 24 (VJR) has the highest mean parameters value of tree dbh, tree height and crown width, followed by Compartment 33 and Compartment 18. Among the three different forest habitats, the results showed that valley-bottom in VJR has the highest forest structure parameters parameters value compared to other forests. The study also found that the forest parameters of trees' dbh, trees' height and crown cover were well disseminated in Compartment 24 (VJR), whereas, less created in Compartment 33 and Compartment 18.

A total of 111 pheasants, 183 primates, 532 small mammals and 1027 understorey birds were recorded in the study area. The observation of selected wildlife showed that most of the primates, small mammals and understorey birds preferred the most in the Compartment 33. Conversely, the pheasants were found more in Compartment 24 (VJR). It showed that some of these animal species could tolerate on the forest composition and structure changes, and the reduction of known primary forest trees as food sources that caused by forest logging. The availability of secondary forest tree species such as *Macaranga* spp. and *Mallotus* spp. in logged forest could initially provide an optional to food choices among the animals. The pheasants that

were known as primary forest species, however, could not tolerate the forest alteration caused by the logging.

Therefore, it can be summarized that the community was species rich in undisturbed forest (VJR) compared to disturbed forest (logged forest). The destruction of forest would eliminate or destroy the floristic compositions and forest architectures which wildlife depended on the forest as habitat for existence. It is crucial to implement proper forest management in order to balance the forest ecosystem between forest as a production and habitat for the forest dwellers.

Abstrak tesis dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

**KOMPOSISI HUTAN, STRUKTUR DAN KELIMPAHAN HIDUPAN LIAR
DI HUTAN-CAMPUR DIPTEROKAP HUTAN SIMPAN SUNGAI LALANG,
SELANGOR**

Oleh

BOYD SUN FATT

Oktober 2003

Pengerusi : Mohamed Zakaria Hussin, Ph.D.

Fakulti : Perhutanan

Hutan hujan tropika adalah di antara ekosistem terkaya di dunia dalam kepelbagaian flora dan faunanya. Walau bagaimanapun, hutan semakin berkurangan disebabkan oleh pencerobohan kawasan hutan seperti pembalakan hutan. Semenanjung Malaysia mengamalkan Sistem Pengurusan Pemilihan (SMS) sebagai salah satu daripada Pengurusan Hutan Mampan (SFM) dalam pembalakan. Maka aktiviti ini boleh merubah komposisi dan struktur hutan sekaligus boleh mempengaruhi habitat tumbuhan dan spesies haiwan.

Satu kajian telah dijalankan di tiga kompartmen berbeza iaitu Kompartmen 18 (lima-tahun dibalak), Kompartment 33 (sepuluh-tahun dibalak) dan hutan primer Kompartment 24 (VJR) di Hutan Simpan Sg. Lalang, bertujuan untuk perbandingan komposisi dan struktur hutannya. Sejumlah tiga 1-ha plot telah dibina di setiap kompartmen dan meliputi tiga jenis habitat hutan, iaitu tanah-rendah, tanah-tengah dan pematang. Kesemua pokok $\geq 5\text{cm}$ dbh di tanda dan diidentifikasi spesiesnya. Parameter pokok (dbh pokok, ketinggian pokok dan keluasan silara) juga dicatat

dalam plot kajian untuk tujuan perbandingan di ketiga-tiga kompartmen. Walau bagaimanapun, komposisi hidupan liar terpilih (primat, ayam hutan, mamalia kecil dan burung bawah naungan) diambil dari kajian lepas sebagai data sekunder. Data ini akan digunakan untuk perbandingan secara diskriptif samada perubahan komposisi dan struktur hutan mempengaruhi kehadiran hidupan liar diantara kompartmen.

Keputusan menunjukkan bahawa pokok dipterokarp tertabur dengan banyak di hutan Hutan Simpan Dara berbanding hutan bekas dibalak. Disebaliknya pokok bukan-dipterokarp didapati banyak tertabur di hutan bekas dibalak berbanding hutan Hutan Simpan Dara. Kompartmen 24 (VJR) kaya dengan spesies pokok merangkumi 342 spesies memiliki 54 famili dan 163 genera, berbanding Kompartmen 33 (46 famili, 124 genera dan 234 spesies) dan Kompartmen 18 (45 famili, 100 genera dan 189 spesies). Jumlah spesies pokok juga rendah di hutan terganggu berbanding di Hutan Simpan Dara. Dipterocarpaceae dan Euphorbiaceae masih dijumpai dengan banyaknya diantara tiga jenis hutan berbeza, dan juga di kesemua habitat hutan berbeza. Ini menunjukkan bahawa famili ini masih dijumpai dengan banyaknya walaupun hutan telah terganggu. Species kepelbagaian diantara tiga kompartmen menunjukkan Kompartmen 24 (VJR) memberi nilai tertinggi bagi Indeks Shannon's dengan $H' = 5.15$ ($H_{\max} = 5.85$), berbanding dengan Kompartmen 33 ($H' = 4.85$; $H_{\max} = 5.45$) dan Kompartmen 18 ($H' = 4.46$; $H_{\max} = 5.24$). Perbandingan dengan tiga jenis habitat hutan di kompartmen berbeza menunjukkan bahawa spesies kepelbagaian adalah tinggi di tanah-lembah yang mana lebih tertumpu di Kompartmen 24 (VJR), diikuti oleh Kompartmen 33 dan Kompartmen 18. Spesies kesamarataan diantara tiga kompartmen adalah tertinggi di Kompartmen 33 memberikan $E_1 = 0.89$, diikuti dekat oleh Kompartmen 24 (VJR) ($E_1 = 0.88$) dan

terendah di Kompatmen 18 ($E_1=0.85$). Manakala, spesies kesamarataan tertabur secara kesembarangan diantara tiga jenis habitat hutan di tiga kompatmen yang berbeza. Indeks Kecerupaan Sorensen's menunjukkan bahawa spesies kelimpahan antara Kompatmen 33 dan Kompatmen 18 adalah hampir serupa. Manakala, spesies kelimpahan di Kompatmen 24 (VJR) adalah kurang serupa dibandingkan dengan dua hutan dibalak tersebut. Keperolehan dan kepelbagaian spesies pokok hutan primer sebagai sumber makanan untuk hidupan liar menunjukkan pengurangan dari hutan VJR kepada hutan dibalak. Taburan pokok sekunder seperti *Macaranga* spp. dan *Mallotus* spp. adalah tertinggi di Kompatmen 18 dan terendah di Kompatmen 24 (VJR).

Terdapat kesignifikasi berbeza terhadap struktur hutan diantara kompatmen yang mana memberikan Kompatmen 24 (VJR) taburan nilai min parameter tertinggi bagi dbh pokok, ketinggian pokok dan keluasan silara, diikuti oleh Kompatmen 33 dan Kompatmen 18. Diantara tiga habitat hutan menunjukkan bahawa tanah-rendah di VJR mempunyai nilai parameter struktur hutan tertinggi berbanding hutan lain. Dalam kajian ini juga menunjukkan bahawa parameter hutan bagi dbh pokok, ketinggian pokok dan keluasan silara adalah tersebar elok di Kompatmen 24 (VJR), dan kurang terbentuk di Kompatment 33 dan Kompatmen 18.

Sejumlah 111 ayam hutan, 183 primat, 532 mamalia kecil dan 1027 burung naugan telah direkodkan dalam kawasan kajian. Pemerhatian terhadap hidupan liar terpilih menunjukkan bahawa kebanyakan primat, mamalia kecil dan burung naugan lebih tertumpu di hutan Kompatmen 33. Sebaliknya, ayam hutan lebih ditemui di Kompatmen 24 (VJR). Ini menunjukkan bahawa sebilangan spesies haiwan ini boleh

bertoleransi terhadap perubahan komposisi dan struktur hutan, dan penurunan pokok hutan primer sebagai sumber makanan disebabkan oleh pembalakan hutan. Keperolehan spesies pokok hutan sekunder seperti *Macaranga* spp. dan *Mallotus* spp. yang terdapat di hutan dibalak dapat menyediakan pemilihan sumber makanan secara optional dikalangan haiwan. Ayam hutan yang dianggap sebagai spesies hutan primer, sebaliknya, tidak dapat bertelorensi terhadap gangguan hutan disebabkan oleh pembalakan hutan.

Maka itu, secara ringkasan bahawa komuniti adalah kaya dengan spesies di hutan tak-terganggu (VJR) berbanding dengan hutan terganggu (hutan dibalak). Kemusnahan hutan boleh menghapuskan atau merosakkan komposisi floristik dan arkitektural hutan yang mana hidupan liar bergantung sebagai habitat untuk wujud. Ia adalah sangat kritikal untuk melaksanakan pengurusan hutan yang sesuai bagi menyeimbangi ekosistem hutan diantara hutan sebagai produksi dan habitat untuk penghuni hutan.

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I certify that Examination Committee met on 6th October 2003 to conduct the final examination of Boyd Sun Fatt on his Master of Science thesis entitle “Forest Composition, Structure And Wildlife Abundance In Mixed-Dipterocarp Forest Of Sungai Lalang Forest Reserve, Selangor” in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The Committee recommends that the candidate be awarded the relevant degree. Members of the Examination Committee are as follows:

AHMAD SAID SAJAB, Ph.D.

Professor
Faculty of Forestry
Universiti Putra Malaysia
(Chairman)

MOHAMED ZAKARIA BIN HUSSIN, Ph.D.

Associate Professor
Faculty of Forestry
Universiti Putra Malaysia
(Member)

FARIDAH HANUM BINTI IBRAHIM, Ph.D.

Associate Professor
Faculty of Forestry
Universiti Putra Malaysia
(Member)

ABDULLAH BIN MOHD., Ph.D.

Faculty of Forestry
Universiti Putra Malaysia
(Member)



GULAM RUSUL RAHMAT ALI, Ph.D.

Professor/Deputy Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 11 FEB 2004

This thesis submitted to the Senate of Universiti Putra Malaysia has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee are as follows:

MOHAMED ZAKARIA HUSSIN, Ph.D.

Associate Professor
Faculty of Forestry
Universiti Putra Malaysia
(Chairman)

FARIDAH HANUM BT. IBRAHIM, Ph.D.

Associate Professor
Faculty of Forestry
Universiti Putra Malaysia
(Member)

ABDULLAH MOHD., Ph.D.

Faculty of Forestry
Universiti Putra Malaysia
(Member)



AINI IDERIS. Ph.D.

Professor/Dean
School of Graduate Studies
Universiti Putra Malaysia

Date: 12 MAR 2004

DECLARATION

I hereby declare that the thesis is based on my original work except for the quotations and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at UPM or other institutions.



BOYD SUN FATT

Date: 05 FEB 2004

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